Graph the following function using a GDC:

\[ f(x) = \frac{2x - 6}{x + 5} \]

**Rational Function:** is a function written in the form \( R(x) = \frac{f(x)}{g(x)} \), where

- \( f(x) \) and \( g(x) \) are polynomials

- IB math SL only looks at

\[ R(x) = \frac{ax + b}{cx + d} \]

**Characteristics of Rationals**

\[ f(x) = \frac{2x - 6}{x + 5} \]

determine:

(i) \[ f(2) = \frac{2(2) - 6}{2 + 5} = \frac{4 - 6}{7} = \frac{-2}{7} \]
(ii) \( f(-7) = \frac{2(-7) - 6}{(-7) + 5} = \frac{-14 - 6}{-2} = \frac{-20}{-2} = 10 \)

(iii) \( f(-5) = \frac{2(-5) - 6}{(-5) + 5} = \frac{-10 - 6}{0} = \frac{-16}{0} = \text{undefined} \)

(iv) \( f(3) = \frac{2(3) - 6}{(3) + 5} = \frac{6 - 6}{8} = \frac{0}{8} = 0 \)

When our output is undefined, it means that we don’t have a coordinate at that \( x \)-value. We have an imaginary line that the graph can’t cross.

- Our imaginary line is called an **asymptote**.

**Analyzing rational functions \( R(x) = \frac{ax + b}{cx + d} \)**

1. **Intercepts**: \( x \)-intercepts occur when the numerator is equal to zero.
   - \( y \)-intercept occurs when \( x = 0 \)
   \[ R(0) = \frac{a(0) + b}{c(0) + d} = \frac{b}{d} \]

2. **Vertical asymptote**: occur when the denominator is equal to 0.
horizontal asymptotes occur at

\[ y = \frac{a}{c} \]

(4) Domain and Range:

\( D \) is all real \#s, except when \( x \) makes the denominator 0

\( R \) is all real \#s, except when

\[ y = \frac{a}{c} \]

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\# (1-15) odd \#s